

IN THE CLAIMS:

1. (Currently Amended) A method of controlling characteristics of a plasma in a semiconductor substrate etch processing chamber using a dual frequency RF source, comprising:

supplying a first RF signal to a first electrode disposed in an etch chamber, wherein the first electrode is disposed beneath a substrate support surface in the etch chamber; and

supplying a second RF signal to the first electrode, wherein an interaction between the first and second RF signals is used to control at least one characteristic of a plasma formed in the etch chamber.

2. (Original) The method of claim 1, wherein the plasma characteristic is at least sheath modulation.

3. (Original) The method of claim 2, wherein the first and second RF signals are of a low enough frequency to provide a strong self-biasing sheath in the plasma.

4. (Original) The method of claim 2, wherein the first RF signal provides a broad ion energy distribution and the second RF signal provides a peaked, well defined ion energy distribution.

5. (Original) The method of claim 4, wherein the first RF signal has a cycle time that is larger than the transit time of an ion in the sheath, and wherein the second RF signal has a period that is nearly equal to or greater than the transit time of an ion in the sheath.

6. (Original) The method of claim 2, wherein the combined applied voltage of the first and second RF signal is used to control a peak-to-peak sheath voltage and a self-biased DC potential.

7. (Original) The method of claim 6, wherein the interaction between the first and second RF signals is a ratio of their applied power.
8. (Original) The method of claim 7, wherein the ratio is used to tune the energy distribution about an average acceleration generated by the DC potential.
9. (Original) The method of claim 1, further comprising:
supplying a third RF signal to a second electrode to form the plasma.
10. (Original) The method of claim 1, wherein the plasma characteristic is at least a power distribution within the plasma.
11. (Original) The method of claim 10, wherein the first and second RF signals provide similar plasma excitation properties and different spatial uniformity profiles.
12. (Original) The method of claim 11, wherein the interaction between the first and second RF signals is a varying effect on the power distribution in the plasma.
13. (Original) The method of claim 12, wherein the first and the second RF signals are selected such that a combined effect of the first and second RF signals produces a substantially flat power distribution.
14. (Original) The method of claim 12, wherein the interaction between the first and second RF signals is used to control the uniformity of a plasma enhanced etch process.
- 15-32. (Cancelled)
33. (Previously Presented) The method of claim 1, wherein the first RF signal has a frequency of about 2 MHz and the second RF signal has a frequency of about 13.56 MHz.

34. (Currently Amended) A method of controlling characteristics of a plasma in a semiconductor substrate etch chamber using a dual frequency RF source, comprising:
determining a desired energy distribution of the plasma; and
producing the desired energy distribution through a controlled interaction between a first and a second RF signal applied to a first electrode disposed in an etch chamber, wherein the first electrode is disposed beneath a substrate support surface in the etch chamber.

35. (Previously Presented) The method of claim 34, wherein the producing step further comprises:

supplying the first RF signal at a first power level; and
supplying the second RF signal at a second power level, the second power level at a predetermined ratio of the first RF signal.

36. (Previously Presented) The method of claim 34, wherein the first RF signal has a frequency of about 2 MHz and the second RF signal has a frequency of about 13.56 MHz.

37. (Currently Amended) A method of controlling characteristics of a plasma in a semiconductor substrate etch chamber using a dual frequency RF source, comprising:

supplying a first RF signal at a first power level to a first electrode disposed in an etch chamber, wherein the first electrode is disposed beneath a substrate support surface in the etch chamber; and
controlling the application of a second RF signal at a second power level to the first electrode to produce a desired power distribution in the plasma.

38. (Previously Presented) The method of claim 37, wherein the desired power distribution is substantially flat.

39. (Previously Presented) The method of claim 37, further comprising:
etching a substrate using the plasma having the desired power distribution.

40. (Cancelled)

41. (Currently Amended) The method of claim [[40]] 1, wherein the electrode is a cathode.

42. (Currently Amended) The method of claim [[40]] 1, further comprising: etching a substrate disposed on the substrate support surface.

43. (Cancelled)

44. (Currently Amended) The method of claim [[43]] 34, further comprising: etching a substrate disposed on the substrate support surface.

45. (Cancelled)

46 (Currently Amended) The method of claim [[45]] 37, further comprising: etching a substrate disposed on the substrate support surface.

47. (New) A method of controlling characteristics of a plasma in a semiconductor substrate etch processing chamber using a dual frequency RF source, comprising:
supplying a first RF signal to a first electrode disposed in an etch chamber; and
supplying a second RF signal to the first electrode, wherein an interaction between the first and second RF signals is used to control at least one characteristic of a plasma formed in the etch chamber, wherein the plasma characteristic is at least a power distribution within the plasma, wherein the first and second RF signals provide similar plasma excitation properties and different spatial uniformity profiles, wherein the interaction between the first and second RF signals is a varying effect on the power distribution in the plasma, and wherein the first and the second RF signals are selected such that a combined effect of the first and second RF signals produces a substantially flat power distribution.

48. (New) A method of controlling characteristics of a plasma in a semiconductor substrate etch chamber using a dual frequency RF source, comprising:

supplying a first RF signal at a first power level to a first electrode disposed in an etch chamber; and

controlling the application of a second RF signal at a second power level to the first electrode to produce a desired power distribution in the plasma, wherein the desired power distribution is substantially flat.